Compur Model 1100

Centrifuge, Laboratory
Micro Hematocrit
Battery Powered, 9-volt, DC

NSN #6640-01-205-2422

Contract #DLA12093C8508

Contractor — Scientific Supply Co.
9405 W. River St.
Schiller Park, IL 60176-1017

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2

Product Code No. 4527

COMPUR™ M1100 Mini-Centrifuge

COMPACT BATTERY-POWERED MINIATURE CENTRIFUGE
FOR HEMATOCRIT DETERMINATIONS AND PLASMA EXTRACTION

Operating Manual

R7109

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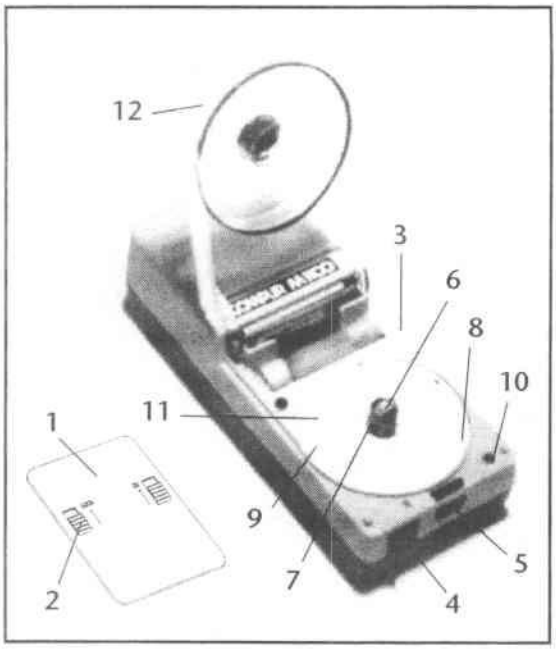

Controls and Indicators

1. Battery carrier
2. Locking slides
3. Socket for optional power pack
4. On-off switch
5. Cover release button
6. Center post
7. Lock release levers
8. Seal
9. Rotor assembly
10. Battery condition indicator
11. Per cent scale for hematocrit
12. Cover

NOTE: Refer to part 2. Unpacking and Preparing for Operation, before attempting to operate the COMPUR M1100 MiniCentrifuge.

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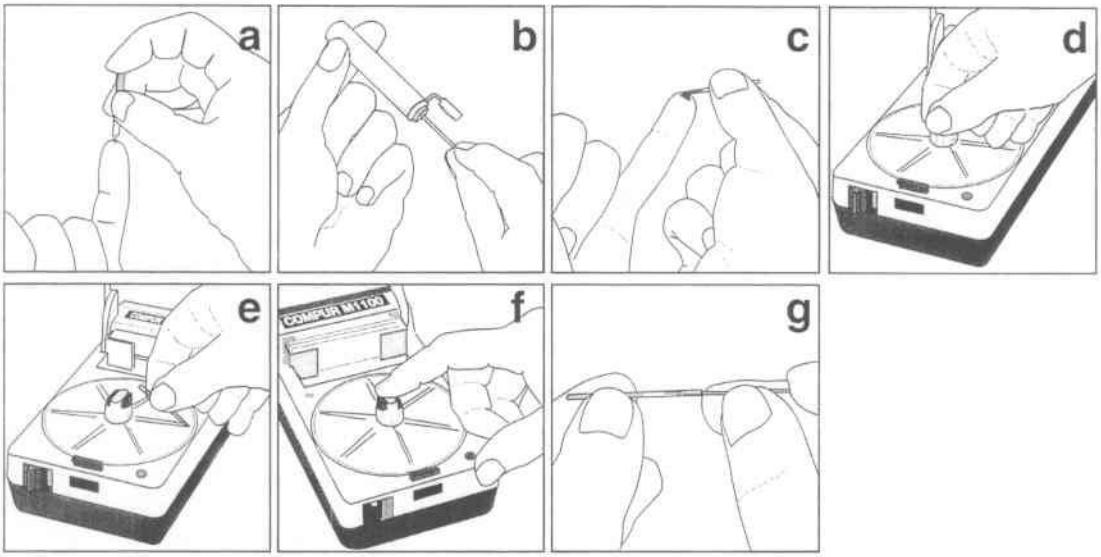

1

Operating Instructions for Hematocrit Determinations and Plasma Extraction

NOTE: Read this operating manual carefully before using the COMPUR™ M1100 Mini-Centrifuge.

A. Hematocrit Determinations

1. Lance finger tip (a).
2. Remove one capillary pipette from dispenser and replace cap (b).
3. Touch end of horizontal pipette to fresh blood specimen and allow to fill completely (c). Avoid trapping air bubbles. Carefully wipe away excess blood from outside surface of pipette.
4. Raise COMPUR M1100 Mini-Centrifuge rotor center post to its upper position by pressing in lock release levers (d)
5. Place pipette in position on rotor with its lower, outer end against a seal and its inner end resting against center post (e). Note the specimen identification number marked on the rotor surface near the pipette.
6. Repeat with up to five additional specimens or controls.
7. Seal pipettes in place by pressing center post downward until it locks in position (f).
8. Close cover. Start rotor by sliding on-off switch to the right. A bright-red mark will become visible, signaling that the instrument has been turned ON. Speed of rotation is automatically maintained at 11,500 rpm.
9. Three minutes and 20 seconds later, the rotor will stop automatically. Once rotor has come to a stop, hematocrit values

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can be read through a clear window in the Cover lid, directly on the per cent scales marked on the rotor next to each specimen pipette.

10. Slide on-off switch to the left. A bright green mark will become visible, confirming that instrument has been turned OFF.
11. Press cover release button and raise cover. The cover is interlocked with the on-off switch and cannot be released unless the instrument has been turned OFF.
12. Raise the rotor center post to release the pipettes by pressing in the lock release levers (d). Remove and discard pipettes.

NOTE: The rotor can be stopped at any time by sliding on-off switch to the left once instrument has been started. However, results will not be accurate if the full 3 minutes 20 seconds of centrifugation have not elapsed. If it is necessary to stop centrifugation prematurely, accurate results can be obtained by again starting the instrument and allowing the full cycle to occur.

B. PLASMA EXTRACTION

NOTE: Capillary pipettes (60.W) are available for plasma extraction. These capillary pipettes must be used with a special plasma rotor (Product No. 4544). Available as an optional accessory.

1. Lance finger tip (a).
2. Remove one capillary pipette from dispenser and replace cap (b).
3. Touch end of horizontal pipette to fresh blood specimen and allow to fill completely (c). Carefully wipe away excess blood from outside surface of pipette.
4. Raise COMPUR M1100 Mini-Centrifuge rotor center post to its upper position by pressing in the lock release levers (d).
5. Place pipette in position on rotor with its lower, outer end against a seal and its inner end resting against center post (e). Note the specimen identification number marked on the rotor surface near the pipette.
6. Repeat with up to five additional specimens from the some or different donors.
7. Seal pipettes in place by pressing center post downward until it locks in position (f).
8. Close cover. Start rotor by sliding on-off switch to right. A bright-red mark will become visible, signaling that the instrument has been turned on. Speed of rotation is automatically maintained at 11,500 rpm.
9. Three minutes and 20 seconds later, the rotor will stop automatically. It can be stopped at any earlier time by sliding on-off switch to the left.
10. Once rotor has come to a stop, slide on-off switch to the left. A bright-green mark will become visible confirming that instrument has been turned OFF.
11. Press cover release button and raise cover. The cover is interlocked with the On-off switch and cannot be released unless instrument has been turned OFF.
12. Raise rotor center post to release the pipettes by pressing in the lock release levers (d). Remove pipettes and process plasma, which can be drawn off with a standard hematocrit capillary pipette if desired (g).

2
Unpacking and Preparing for Operation

GENERAL

The COMPUR M1100 Mini-Centrifuge should be unpacked and handled with care to minimize the possibility of accidental damage. Unpack the instrument and inspect it for any visible signs of damage. If damage to the instrument is found, file a complaint with a representative of the carrier immediately.
Save all packing materials for use if it becomes necessary to return the instrument for service or repair.

INSTALLING BATTERIES

If the instrument has been shipped without batteries installed, prepare it for use by installing six C cells. Alkaline long-life batteries are recommended for best service. Remove the battery carrier from the underside of the instrument by sliding the two locks in the direction opposite to that indicated by the arrows next to them (h). Correct position of the batteries is indicated by polarity marks on the carrier at each battery position. When replacing the carrier make sure the two locks are securely fastened.

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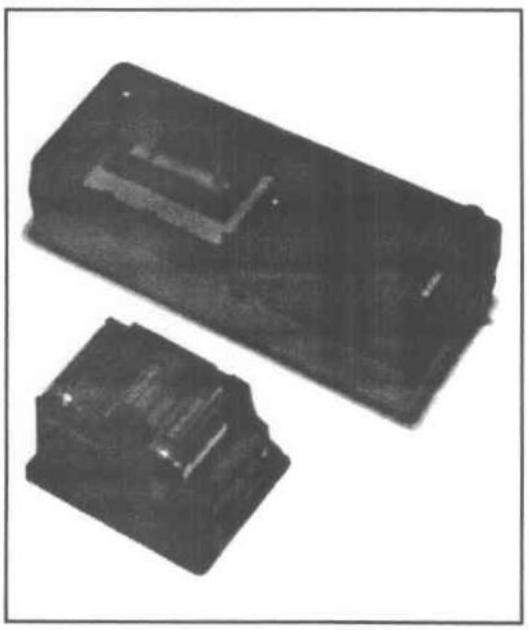

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USING THE POWER PACK

If the instrument is to be used only with the COMPUR M1100 Power Pack, it is not necessary to install batteries. However, batteries may be left in the instrument. Plug the Power Pack connector into the socket on the instrument's right side. And connect the Power Pack's line cord to a convenient 117 V.60 Hz outlet. Connecting the Power Pack automatically disconnects the batteries. They are neither exhausted nor recharged during use of the Power Pack.

3
Principles of Measurement

The COMPUR M1100 Mini-Centrifuge is a simple, compact and readily portable instrument which operates either from replaceable self - contained batteries or from power outlets using an optional accessory Power pack. Centrifuging speed of 11.500 rpm provides a force of 5396 g, rotation automatically stops 3 minutes and 20 seconds after the rotor is started. Blood samples are taken in heparinized capillary pipettes, which are automatically sealed at their outer ends when placed and locked into the instrument's rotor. At the conclusion, hematocrits are read directly in per cent from scales marked on the surface of the rotor next to each specimen. Up to six specimens may be tested at a time.

The COMPUR M1100 Mini-Centrifuge is for *in vitro* diagnostic use.

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4
Operation and Controls

NOTE: See front cover fold-out for photograph of controls and indicators.

On-Off Switch

Bright red and green indicator marks are placed beneath the slide switch (4). The red indicator is visible when the instrument is turned ON. The green indicators is visible when the instrument is turned OFF. The switch is interlocked so it cannot be turned ON if the cover is open.

Cover Release Button

The cover release button (5) is interlocked with the on-off switch, so that the cover (12) cannot be opened unless the instrument has been turned OFF.

Battery Condition Indicator

If battery voltage is insufficient to provide further operation. A red indicator lamp (10) inside the cover (lower right-hand corner) is illuminated. If the lamp is found illuminated at the conclusion of a determination, the results of that determination will be valid, but the batteries should be replaced before attempting another. If the lamp is illuminated when the instrument is first turned ON, replace batteries immediately.

Center Post and Lock Release Levers

To insert capillary pipettes, the center post (6) must be in its upper position. When it is released by pressing in the two black lock release levers (7), a spring raises it to its upper position. Insert completely filled pipettes between the center post and the seal (8) at the outer end of each specimen position. To seal the pipettes, press directly down on the top of the center post, locking it in place.

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Results

Hematocrits from 10% to 80% are read directly from the scales (11) marked on the surface of the rotor (9) next to each specimen. If elevated values are found, repeat centrifugation using the same pipettes until no further change can be seen.

Hematocrits can be combined with hemoglobin determinations to give the Mean Corpuscular Hemoglobin Concentration (MCHC) the % concentration of hemoglobin in individual erythrocytes, by using the following formula.

$$\text{MCHC, per cent} \frac{\text{Hemoglobin g/dl}}{\text{Hematocrit, \%}} \times 100$$

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5
Specifications

Power Supply
- 6 size C batteries. An optional COMPUR M1100 Power Pack is available for operation from 117 V.60 Hz

Dimensions
- 86x59x208 mm ($3\frac{3}{8}$"x $2\frac{5}{16}$"x $8\frac{3}{}$

Weight

With Batteries	825 g (20 oz)
Without Batteries	425 g (15 oz)

Temperature Range

Operation	0° to +40°C (+32° to +104
Storage	-20° to +55°C (-4° to +131°

Measurement Range:
- 10% to 80%

Speed of Rotation:
- 11.500 rpm

Centrifugal Force:
- 5396 g

Programmed Operation:
- 3 minutes 20 seconds

6
Calibration and Performance Checks

No calibration procedures are required for use of the COMPUR M1100 Mini-Centrifuge. Performance checks may be made by testing hematology controls of known composition, or by comparing analytical results for specimens to results obtained for the same specimens using reference test methods.

NOTE: Standards or controls intended specifically for use with electronic counters or other methodologies may not yield corresponding values for hematocrits determined by centrifugation.

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7
Service and Maintenance

The COMPUR M1100 Mini-Centrifuge should be cleaned and disinfected using only disinfectants with an alcohol base, which will not damage the plastic housing and other parts. If in doubt about a disinfectant, apply a drop at a concealed location to see whether or not it damages the plastic. Wipe sites to be cleaned with a cloth moistened with disinfectant. The rotor (9) can be removed for cleaning by releasing the lock release levers (7), raising the center post (6) and lifting the rotor out. The six seals (8) at the outer edge of the rotor should be cleaned regularly to ensure dependable sealing during use.

8
Accessories and Supplies

Accessories	Product Code No.
COMPUR® M1100 Power pack (117 V, 60 Hz)	4531
C Alkaline Battery (6 required)	4530
Hematocrit Rotor	4542
Plasma Rotor (required for use of 60ul capillary pipettes)	4544

Supplies	Product Code No.
Capillary Pipettes (9µl) Heparinized for Hematocrits (5 dispensers of 100)	4529
Capillary Pipettes (60.µl) Heparinized, for Plasma Extraction (5 dispensers of 20) (Plasma Rotor required)	4528

The above accessories and supplies are available from Ames Division, Miles Laboratories, Inc., P.O. Box 70, Elkhart, Indiana 46515. Attention: Ames Order Services Department.

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SERVICE POLICY

Ames Division, Miles Laboratories, Inc. will extend the following service policy to only the original purchaser of this instrument:

1. If this instrument becomes inoperable prior to one year after the date of installation, for any reason other than unusual or abusive use or handling, Ames will, at its option, have this instrument repaired or replaced. Ames will make no charge for labor or parts or for shipment of the repaired or replacement unit back to or from the purchaser.
2. If claim is made subsequent to one year from date of installation by the original purchaser of this instrument that this unit is inoperable, Ames undertakes no obligation to repair or replace it. All costs involved in such repair are to be borne by purchaser.

In event of inoperability, purchaser should promptly notify the Ames Technical and Customer Services Department, (219) 264-8901, for instructions for handling repair of this instrument.

Ames Division, Miles Laboratories, Inc. does not assume any other liability except as stated above.

Servicing Instructions

Minicentrifuge
COMPUR M1100
COMPUR M1101

8

SERVICING INSTRUCTIONS for the Minicentrifuge	6500 000

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9

Orders for Spare Parts

In order to guarantee a quick and accurate handling of the orders for spare parts at Compur-Electronic, we ask you to do your orders by means of the enclosed list of spare parts.

Please indicate in every order:

- name of part (not required in the case of electric parts).
- complete number of the part (list of spare parts - column 2).
- desired number of pieces

Explanations to the List of Spare Parts

	Example
The number indicated in column 5 of the list of spare parts (no. of circuit diagram) is a help for the quicker finding of the parts in the diagrams. The number is composed as follows:	6500 000 /1-032
▪ the first seven figures indicate the number of the service manual or the type of instrument.	6500 000 /
▪ the number after the oblique stroke (/) is the "table number".	/ 3
▪ the number after the hyphen (-) is the part number.	-032
▪ instead of the part number it is also possible that the number of an electric element is indicated.	-C701

SERVICING INSTRUCTIONS for the Minicentrifuge	6500 000

1. THE MINICENTRIFUGE SYSTEM

Bayer Diagnostic + Electronic offers two Minicentrifuge models:
COMPUR M 1100 for human medicine
COMPUR M 1101 for veterinary medicine.

The concept and construction of the two models are identical. They

differ only in the duration of centrifugation. This amounts to 3 min. 20 sec. for the M 1100 model and 8 min. for the M 1101 model.

These centrifuges are characterized by ease of operation and can be em-ployed to determine the hematocrit value and to extract plasma.

Various capillary designs are offered for this purpose. They are listed in the operating instructions under "consumables".

1.1 Definition

The hematocrit value (Het) is understood to mean the proportion of cellular or corpuscular elements (eg erythrocytes and leukocytes) of whole blood expressed in percentage. It is determined by centrifuging whole blood causing the cells and plasma (the liquid component of the blood) to separate owing to the different densities of the particles. The height of the corpuscle column is then compared to the height of the entire column and the proportion of cells is expressed as a percentage of the blood.

1.2 Technical Data

Overall dimensions	3 3/8" x 2 1/16" x 8 3/16"
Weight (with 6 batteries):	1 lb. 12 oz.
Speed of rotation:	11,500 rpm - electronically regulated
Relative centrifugal	force: 5396 g. (11 lb. 14 oz.)
Run-down time:	approx. 10 sec. with automatic countercurrent braking
Permissible temperature: range	during operation: 0° C to +40 °C during storage: -20°C to +55°C

Shock and vibration testing in compliance with German Industrial Standard DIN 58,390.

1.3 System Accuracy

Centrifuging time in the:
COMPUR M1100: 3 min. 20 sec. ± 5 %
COMPUR M1101: 8 min. ± 5 %
Accuracy: ± 1%
Reproducibility: 1 %

1.4 Power Supply

Manganese-alkali baby cells IEC (LR 14 1.5 V) are provided as the source of current.

A red light-emitting diode (10) serves to check the battery voltage. If the battery voltage is inadequate for the next centrifuging operation, the red warning lamp (10) will light up.

To insert the baby cells, remove the battery pack (1).
To do this, pull back the two slide bars (2). Remove the battery pack. The position of the batteries is schematically illustrated in the battery pack.
Reinsert the battery pack and lock it in position by pushing the slide bars into the "LOCK" position.

The stabilized, short-circuit-proof *power pack* (Order No. 6910-002) can also be used as the current source.

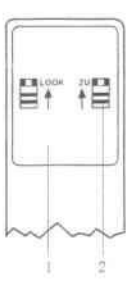
The power pack is plugged into the socket (3). In so doing, the battery circuit is interrupted.

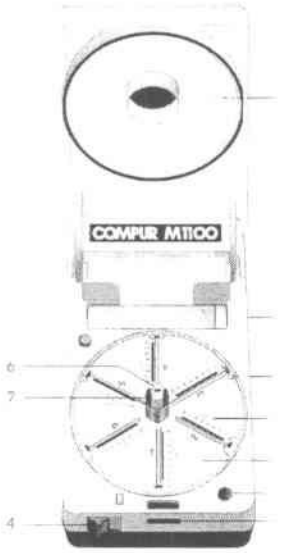
1.5 Brief Operating Instructions

Detailed operating instructions, a knowledge of which is presupposed, are enclosed with every centrifuge.

Control Layout

84527023	1	Battery pack
84527024	2	Slide bars for battery pack
84527042	3	Socket for power pack
84527012	4	On-Off switch
84527017	5	Cover lock button
84527020	6	Clamping member
84527020	7	Catch lever
84527051	8	Seal
84527020	9	Rotor
84527043	10	Battery warning lamp
84527020	11	% Scale for Hct value
84527009	12	Space for lancets
	13	Space for capillary dispenser





1.5.1 Opening the Cover

The cover can be opened only when the on-off switch (4) is in the "green" position, indicating that the instrument has been shut off manually. Press the cover lock button (5) and open the cover.

1.5.2 The Rotor

Two different rotors are available:
- a rotor for hematocrit determination (which is signified by the % scales), or
- a rotor for plasma extraction (a rotor without scales).

Inserting the Rotor

Press down on the clamping member (6) with your finger until the rotor has been properly positioned and locked in place on the motor shaft by the two catch levers (7). In this condition, the black catch levers point outwardly and the rotor must not be able to be lifted off the shaft.

1.5.3 Inserting the Capillaries

To insert the capillaries, move the clamping member (6) to its uppermost position. To do this, press the two black catch levers (7) together. The clamping member will then rise. Insert the capillaries between the clamping member (6) and the seal (8). Depress the clamping member (6), thereby sealing and locking the capillaries into position. Close the cover tightly.

1.5.4 Centrifuging

The instrument will not start unless the cover has been closed tightly. Before closing the cover, however, check to see that the clamping member (6) has been depressed and that the rotor has been locked in position.

To start: slide the on-off switch (4) until the red marking is clearly visible.

Centrifuging time: 3 min. 20 sec. (8 min. for the M1101).

The speed of rotor rotation during this time is maintained constantly at n = 11,500 rpm.

The drive motor will shut off automatically after the full centrifuging time and the rotor will be brought to a standstill by electric countercurrent braking in about 10 to 15 sec. Do not open the cover until the rotor has come to a complete standstill. Slide the on-off switch (4) until the "green" marking becomes visible. Then depress cover lock button (5).

If the centrifuge must be opened prematurely, shut it off manually by returning the on-off switch to the "green" marking.

2. FUNCTIONAL CHARACTERISTICS AND CIRCUITRY

2.1 These specifications apply to the Minicentrifuge featuring printed wiring boards 6500 050 00 to 6500 050 04.
(The numbers are etched into the wiring boards.)

See also: Circuit diagram 6500 000 050 97 03
Printed wiring board, Table 2, Fig. 1.

2.1.1 Turning on the Minicentrifuge

When the sliding on-off switch is actuated, two switches are closed in succession:

2.1.1.1 Switch S1 closes the principal circuit, thereby energizing the operating voltage UB prior to starting the centrifuge.

2.1.1.2 Switch S2 is closed subsequently, thereby actuating the timing circuit which in turn energizes the motor and the battery voltage monitor circuit.

2.1.2 The Timing Circuit

Once the instrument has been started by means of switch S2, the timing circuit functions to hold the switch in the energized position for the duration of centrifugation.

2.1.2.1 After switch S2 is closed, the transistor T 102 becomes conductive. This means that the operating voltage U_B is applied across IC102 pin 4 and pin 8. Transistor T 102 is held open via T 103.

IC 102 pin 2 is triggered (start) with a time lag by R 125 and C 104.

The operating time of the motor (3 min 20 see) is determined by R 109, R 110 and C 107; The operating time can be adjusted by means of potentiometer R 110.

2.1.2.2 At the same time IC 102 is energized, transistor T 103 is energized and opens via R 129 the motor brake. T 110 (MOSFET) is blocked in so doing. It is now possible for the motor to start.

2.1.2.3 After expiration of the set time of the IC 102, its output pin 3 drops to zero volts. This causes transistors T103, T102 and T101 to block and the MOSPET T110 becomes conductive to decelerate the motor. The motor is brought to a standstill by the counter-electromotive force in about 15 to 20 seconds.

2.1.3 Motor Speed

The rotor must be provided with six capillaries for this purpose and the cover must be closed tightly. The motor speed must not be measured or adjusted until after an operating interval of about 20 seconds, since, uniform operation can be guaranteed only after this interval.

2.1.3.1 The motor speed amounts to the following figure:

$n = 11{,}500 \begin{smallmatrix} +50 \\ -400 \end{smallmatrix}$ rpm

The speed is adjusted by means of potentiometer R102.

The capacitor C105 and the diode Gr 101 are interference suppression components. A time shift is possible if they malfunction.

2.1.4 Battery Voltage Monitoring

If the battery voltage falls below U_B 5.3 V, the red light-emitting diode will light up not later than 30 seconds after the instrument is started. It will remain lit until a new set of batteries is provided or until the power pack is attached.

2.1.4.1 The threshold switch IC103 serves to monitor the voltage. The threshold voltage is set by means of potentiometer R125 (do not adjust R125).

If the voltage falls below the threshold value at IC103/4 to chassis, transistor T104 becomes conductive when the time delay circuit (2.1.4.2) applies voltage across the base of T104. This causes the flip-flop (IC 104.1 and IC 104.2) to be switched and the output 6 thereof is supplied with voltage, thereby energizing the light-emitting diode LD 101 via R120 and T107.

The flip-flop is reset by interrupting the power supply, for instance by removing the battery pack.

2.1.4.2 The time delay circuit serves to indicate the battery voltage break-down which occurs briefly as the motor operates and which is not displayed by the red light-emitting diode.

The delay interval (maximum 30 sec.) is determined by R123, C105 and the Zener diode Z 101. After expiration of this interval, the AND operation formed by IC 104.4 is released. The inverter IC 104.3 applies voltage via R 130 across the base of T104. Hence, the voltage monitoring circuit is again functioning properly.

2.1.4.3 When the power pack is attached, the jack disconnects the battery pack, thus rendering the voltage monitor circuit ineffective.

2.1.5 In case of premature shut-off

by actuating the sliding on-off switch, voltage is applied via S1 to the base of T104, thereby blocking T103.

The MOSFET T110 thereby becomes conductive via R129 and the motor is decelerated by the counter-electromotive force.

2.2 The following specifications apply to the Minicentrifuge featuring printed wiring boards 6500 050 05 and 6500 050 06. (The numbers are etched in the wiring boards.)

See also: Circuit diagram 6500 000 050 97 06
Printed wiring board, Table 2, Fig. 2

2.2.1 Turning on the Minicentrifuge

When the sliding on-off switch is actuated, two switches close in succession:

2.2.1.1 Switch S1 closes the principal circuit, thereby energizing the operating voltage U_B prior to starting the centrifuge.

2.2.1.2 Switch S2 is closed subsequently, thereby actuating the timing circuit which in turn energizes the motor and the battery voltage-monitor circuit.

2.2.2 The Timing Circuit

Once the instrument has been started by means of switch S2, the timing circuit functions to hold the switch in the energized position for the duration of centrifugation.

2.2.2.1 After switch S2 is closed, transistor T102 becomes conductive. This means that the operating voltage U_B is applied across IC102 pin 4 and pin 8. Transistor T102 is held open via T103.

A trigger pulse which is time delayed by RC-section R111/C 102 becomes effective at IC102/11 via T106 and T107, thereby energizing the timer IC102.

The operating time of the motor is determined by R 122, R 123 and C 107.

The operating time can be adjusted by potentiometer R122.

	Bridge 1	Bridge 2	Operating time t
COMPUR M 1100	closed	open	3 min. 20 sec.±5%
COMPUR M 1101	open	closed	8 min. ±5%

2.2.2.2 At the same time IC102 is activated, transistor T103 becomes conductive and opens the motor brake via R104. T108 (MOSFET) is blocked at the same time. It is now possible for the motor to start.

2.2.2.3 After expiration of the preprogrammed time of IC102, a signal is applied across its output pin 10. This blocks transistors T103, T102 and T101 and MOSFET T108 becomes conductive to decelerate the motor. The motor is brought to a standstill in about 10 to 15 seconds due to the counter-electromotive force.

2.2.3 Motor Speed

The rotor must be provided with six capillaries for this purpose and the cover must be closed tightly. The motor speed must not be measured or adjusted until after an operating interval of about 20 seconds, since uniform operation can be guaranteed only after this interval.

2.2.3.1 The motor speed amounts to the following figure:

$n = 11{,}500\ ^{+50}_{-400}$ rpm

The speed is adjusted by means of potentiometer R102.

2.2.3.2 The capacitor C105 and the diode Gr 101 are interference suppression components. A time shift is possible if they malfunction.

2.2.4 Battery Voltage Monitoring

If the battery voltage falls below U_B = 5.3 V, the red light-emitting diode will light up not later than 30 seconds after the instrument is started. It will remain lit until a new set of batteries is provided or until the power pack is attached.

2.2.4.1 The threshold switch IC103 serves to monitor the voltage. The threshold voltage is set by means of potentiometer R125 (do not adjust R125!).

If the voltage falls below the threshold value at IC103/4 to chassis, transistor T109 becomes conductive when the time delay circuit (2.2.4.2) applies voltage across the base of T109. This causes the flip-flop (IC104.1 and IC104.2) to be switched and the output 6 is supplied with voltage, thereby energizing the light-emitting diode LD101 via R131 and T110.

The flip-flop is reset by interrupting the power supply, for instance by removing the battery pack.

2.2.4.2 The time delay circuit serves to indicate the battery voltage breakdown which occurs briefly as the motor operates and which is not displayed by the red light-emitting diode.

The delay interval (maximum 30 sec.) is determined by R137, C111 and the Zener diode Z102. After expiration of this interval, the AND operation formed by IC104.4 is released. The inverter IC104.3 applies voltage via R130 to the base of T109. The voltage monitor circuit is thus again functioning properly.

2.2.4.3 When the power pack is attached, the jack disconnects the battery pack, thus rendering the voltage monitor circuit ineffective.

2.2.5 In case of *premature shut-off:*

by actuating the sliding on-off switch, voltage is applied via S1 to the base of T104, thereby blocking T103.

The MOSFET T108 is thereby rendered conductive via R104 and the motor is decelerated by the counter-electromotive force.

2.3 Motor Speed

The rotor must be provided with six capillaries for this purpose and the cover must be closed tightly. The motor speed must not be measured or adjusted until after an operating interval of about 20 seconds, since uniform operation can be guaranteed only after this interval.

2.3.1 The speed of the motor, which is set and adjusted by means of the potentiometer R102, amounts to the following figure:

$$n = 11{,}500 \begin{matrix} +50 \\ -400 \end{matrix} \text{ rpm}$$

2.3.2 The capacitor C 105 and the diode Gr 101 are interference suppression components. A time shift is possible if they malfunction.

2.4 Battery Voltage Monitoring

If the battery voltage falls below $U_B \leq 5.3$ V, the red light-emitting diode will light up not later than 30 seconds after the instrument is started. It will remain lit until a new set of batteries is provided or until the power pack is attached.

2.4.1 The threshold switch IC103 serves to monitor the voltage. The threshold voltage is set by means of potentiometer R125 (do not adjust R125 !).

If the voltage falls below the threshold value at IC103/4 to chassis, transistor T109 becomes conductive when the time delay circuit (2.4.2) applies voltage across the base of T109. This causes the flip-flop (IC104.1 and IC104.2) to be switched and its output 6 is supplied with voltage, thereby energizing the light-emitting diode LD101 via R131 and T110.

The flip-flop is reset by interrupting the power supply, for instance by removing the battery pack.

2.4.2 The time delay circuit serves to indicate the battery voltage break-down which occurs briefly as the motor operates and which is not displayed by the red light-emitting diode.

The delay interval (maximum 30 sec.) is determined by R137, C111 and the Zener diode Z102. After expiration of this interval, the AND operation formed by IC104.4 is released. The inverter IC104.3 applies voltage via R130 to the base of T109. The voltage monitor circuit is thus again functioning properly.

2.4.3 When the power pack is attached, the jack disconnects the battery pack, thus rendering the voltage monitor circuit ineffective.

2.5 In case of *premature shut-off*

by activating the sliding-on-off switch, voltage is applied via S1 to the base of T104, thereby blocking T103.

The MOSPET T108 is thereby rendered conductive via R104 and the motor is decelerated by the counterelectromotive force.

3. Repair Instructions

To be able to properly repair and inspect the centrifuge, the following test equipment and accessories are required:

3.0.1 Test Equipment

DC power pack with fine adjustment

Range = 10 V, accuracy of adjustment and stability = 10 mV with an adjustable current limitation = 500 mA.

More suitable:
a digitally adjustable power pack NG
eg DIGISTANT TYPE 6414
(Manufacturer: Buster Co., 7562 Gernsbach)

30 V, 3 A, resolution 1 mV

Stopwatch

Stroboscope: accuracy of measurement greater than 0.5 ‰

3.0.2 Accessories

Sham cover: LA1 - 6500 000 000 (for speed adjustment)
Screwdriver: approx. 2" long, 1/16" dia. (for speed adjustment)
Assembly clip: VM3 - 6500 000 000 (for starter)

3.1 Cleaning

Generally speaking, there is always some danger of infection when working with equipment which has some excess blood dried onto it.

Therefore always wear rubber gloves when cleaning the equipment.

For cleaning, use only an aldehyde-based disinfectant which does not attack plastics, eg "Korsolin® 3%".

Use a cloth moistened with this disinfectant to wipe off the sites to be cleaned. If you are not sure that the disinfectant you are using will not attack the plastics, it is advisable to test its reaction to plastics at a concealed location inside the instrument.

Remove the rotor from the centrifuge and rinse it off with running water. When cleaning the rotor, pay special attention when cleaning the capillary seals (041). They must be cleaned of all residual blood (using a swab or brush) so that the capillaries will be sealed reliably.

When cleaning the upper housing (001), make sure that the speed adjustment hole is stopped with the plug (007). The motor must *not* be removed from the upper housing for cleaning.

3.2 Battery Pack

All points of contact must be free of corrosion.

Battery springs: When inserting the battery, the spring clearance must be approx. 1.0 mm. This will ensure adequate contact pressure.

Contact springs in the upper housing:
When inserting the battery pack, the contact pine must pre-bias the springs approx. 2.5 mm.

Locking slide bar 065:
When removing the battery pack, press the slide bar in the opposite direction indicated by the arrow. In so doing, lift the resilient end out of the retention groove.

3.3 Rotor 040

A rotor for hematocrit determination and a rotor for plasma extraction (Cat. No. 4 000 000 460) are available as accessories for both models (COMPUR M1100 and M1101). The rotor for plasma extraction is provided with larger grooves and seals, but has no percentage scales.

Be sure to make a routine check of the rotor each time the instrument is repaired.

3.3.1 When the clamping member (6) is depressed, the rotor must be positioned on the collar of the motor shaft and reliably retained there by the two catch levers (7) which engage the clamping member. The rotor will otherwise rise during centrifugation and rub against the cover.

3.3.2 When the catch levers are unlocked to release the clamping member of the hematocrit rotor, the compression spring must quickly push the clamping member together with the inserted capillaries to the maximum upper position.

In the case of the plasma rotor, the clamping member has to be pulled up by hand, since the force required to clamp the capillaries is greater.
Replace the rotor if it does not properly perform the functions described above.

3.3.3 Capillary Seals (041): it is imperative that they be clean and undamaged. Check to see whether the seals reliably seal the capillaries by centrifuging capillaries which have been filled with water.

In case of doubt, replace the seals (041).

3.3.4 There are two models of the clamping members:

In the previous model, the clamping member and the catch levers are almost flush. For this reason, the operator's finger tip touched the two catch levers while depressing the clamping member, thus preventing the catch levers from locking in position. Traces of wear on the cover indicate this operational malfunction.

It is advisable in this case to replace the rotor by the current design. (The catch levers are recessed relative to the clamping member.)

3.4 Upper Housing Cover (010)

If the cover, the sealing foil (014) or the rubber ring are damaged or leaky, the complete cover assembly must be replaced. It is important that the rubber ring seal the rotor space well when the cover is closed, since a vacuum is intended to form in this space during centrifugation which favourably influences the speed (n=11,500 rpm) and current consumption (< 400 mA).

Examine the various parts when the capillaries are in place. To measure current consumption during centrifugation, it is advisable to use a power pack as the source of current and to interpose a current meter. To examine the cover, press it with your hand. If the current consumption drops substantially in so doing, this indicates that the cover did not previously seal properly.

3.4.1 Remedy: clean the rubber ring with spirit and glue on a new sealing foil (014).

If the cover cannot be made tight in this manner, it must be replaced.

3.4.2 Replacing the Cover:

Remove the battery pack and unscrew the retention plates (015).

3.4.3 After inserting the new cover, check the following before continuing:

The cover must open and close easily. It must be positioned on the upper housing without being twisted or skewed or misaligned. The cover lock (025) must close the cover tightly.

Closing the cover must disconnect the starter safeguard lock (024) without having to tilt the instrument.

Check the rotor speed and current consumption.

3.5 Opening the Minicentrifuge

Remove the battery pack and the two feet (006) of the lower housing unit.

Remove the five fastening screws (07, 15). Lift off the upper housing unit.

3.6 Cover Lock (025)

The cover lock must reliably lock the closed cover. The spring for the cover lock (026) must firmly press the lock (025) forward.

If necessary, replace the spring (do not bend it!)

3.7 Closing the Minicentrifuge

3.7.1 Apply a little grease to the balls and place them in the outer recess of the upper housing on the right side.

3.7.2 Assemble the starter: insert the compression springs (023) and (032) as well as the starter safeguard lock (024). Fix them by means of the assembly clamp VM3 - 6500 000 000.

3.7.3 Insert both the starter and the assembly clamp into the upper housing unit in such a way that the compression spring (032) is situated on the ball.

Holding the starter in this position with your finger, remove the clamp, replace the lower housing unit and screw tight.

3.7.4 Glue the feet (006) onto the lower housing unit with "LOCTITE IS-413".

3.8 Starter (020)

3.8.1 The starter must catch in the red and green positions. If the ball catch cannot be felt, there is some danger that the ball may have fallen into the interior of the instrument. (The ball will rattle when the instrument is shaken; a noise will be heard during centrifugation. Beware of a short-circuit !)

3.8.2 The starter must reliably switch the switches S1 and then S2. The two switch pins, however, must have some play. If necessary, adjust the position of the switch.

3.8.3 The starter must not be able to be moved when the cover is open. It must be locked by the starter safeguard lock (024).

3.8.4 The starter safeguard lock must be released when the cover is closed.

3.9 Switches S1 and S2 (10)

The red trip cams of switches S1 and S2 must lie exactly above one another in both directions in order to guarantee the switching sequence which is predetermined by the starter (020).

S2 must close after S1. S1 is on top (see Sect. 3.8.2).

3.10 Miniature Voltage Socket (16)

When the power pack is connected, the battery circuit must be disconnected reliably and the main power supply must be connected.

When the power pack is not in use, the socket must close the battery circuit reliably.

3.11 Upper Housing Unit (001) with motor

If one of these two parts is defective, you will receive as the replacement part the:

- upper housing unit with motor,
- contact springs 002 and 003
- and Lid (010).

The motor must not be removed for cleaning, since it is very difficult to incorporate it again (see sect. 3.16).

If the motor of the repair unit does not run at all or much too slowly, unsolder the motor and supply an external voltage of 2,4 V. If the motor then runs correctly, this means that the malfunction is located in the printed wiring board. If the motor does not run correctly, then repair according to sect. 3.16.

3.12 Printed Wiring Board -LP- (050)

Printed wiring board components must not be interchanged. If repair becomes necessary, the entire wiring board must be replaced. When servicing the instrument, only the following components may be used for adjustment:

the potentiometer R102 for speed control
the potentiometer R110 for centrifuging time (LP digit 00 ... 04)
the potentiometer R122 for centrifuging time (LP digit 05 ... 08)

The number 6500 050 03, for instance, is etched into the printed wiring board. (It is located near the hole for the motor). The last two digits (eg 03) indicate the digit of the printed-wiring board.

LP digits 00 - 04 correspond to the previous designs.

From LP digit 05 onward the timer IC 102 can be adjusted with the potentiometer R122 from 3 mins to 8 mins.
As a spare part you will get only the printed wiring board with the most recent design, i.e. with the highest index, e.g. 6500 050 08.

This printed wiring board can also be used as a replacement for printed wiring boards with a lower index.

The connections on the printed wiring board are figured in the wiring diagram (table 4 and 5) or in the block diagram (table 6)

3.13 Speed Adjustment

3.13.1 General

Set your stroboscope to 11,500 rpm and allow it to flash on the rotating rotor. This will appear to stand still when the set speed is attained. Choose one of the six large figures (1-6) as a measurement mark, eg the "1". This figure must be clearly legible by the stroboscope flashes when the speed has been adjusted correctly. The number must always remain in the same location and may oscillate about this location only slightly. When measuring the speed, it should also be observed that, owing to the stroboscopic effect, the measurement marks will also produce stationary images at speeds amounting to only 1/2, 1/4, 1/8 etc. of the theoretical speed. For this reason, it is advantageous to set the potentiometer to its maximum speed and then turn it back to

the theoretical speed while adjusting the speed of the Minicentrifuge.

If the stroboscope is used as the means of measurement, then measurement must begin with the highest flash frequency. Then reduce the frequency until the mark on the rotor appears to remain stationary for the first time.

3.13.2 Measurement Procedure

Raise the cover and place the capillaries on the rotor. Remove the plug (007) from the upper housing unit. Attach the sham cover LA1 = 6500 000 000. Supply current using the power pack U_B = 6.5 V. Start the instrument.

Set the stroboscope for the correct range and value and allow it to flash on the rotor.

The theoretical speed is n = 11,500 rpm.

Using the special-purpose screwdriver, first turn the potentiometer R102 to its maximum value (highest speed) and then slowly turn it back again. As soon as the stroboscopic effect mentioned above occurs, the speed is correct (eg the "1" must appear to stand still).

During measurement, please observe Sect. 3.4.

3.13.3 Rundown-Time of the Rotor (with Capillaries)

The proper rundown time must not exceed a maximum of 15 sec. when the counter-current brake is employed (see Sect. 2.2.13).

The rundown time without the brake must be greater than 30 sec. This measurement is indicative of the friction present in the rotating system. If the rundown time is substantially less than 30 sec., replace the upper housing and motor unit. Do not oil the motor! To measure the rundown time, allow the Minicentrifuge to run for about 20 sec., then shut off the operating voltage and measure the rundown time starting at this moment.

NB: When affected by stroboscope flashes (or any other form of radiation), the instrument can turn on the red warning lamp, even when the batteries are still in order.

3.14 Setting the Centrifuging Time

Open the Minicentrifuge and supply current using the power pack U_B = 6.5 V. Set the time by adjusting the potentiometer R110 to

t = 3 min 20 sec ± 5% (COMPUR N 1100)
t = 8 min ± 5% (COMPUR M 1101).

Variable potentiometers: R 110 for LP 6500 050 00 to 04
R 122 for LP 6500 050 05 to 08

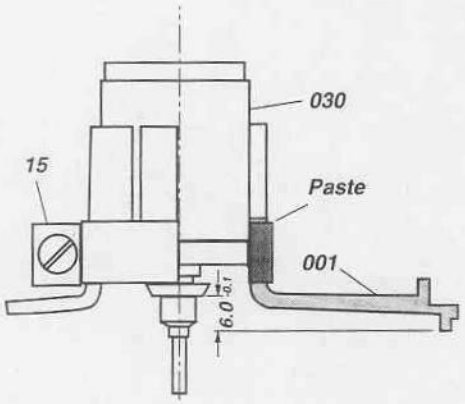
3.15 Lower Housing Unit (005)

If the lower housing unit is replaced, attach the name plate (bearing the serial number) to the new lower housing unit.

3.16 Motor (030)

If the motor does not start with a frequency voltage of 4,2 V or if it runs too slow. the centrifuge has to be equipped with a new motor. We recommend to replace complete upper housing unit with the motor (see sect. 3.11).
When changing the motor, please proceed as follows:

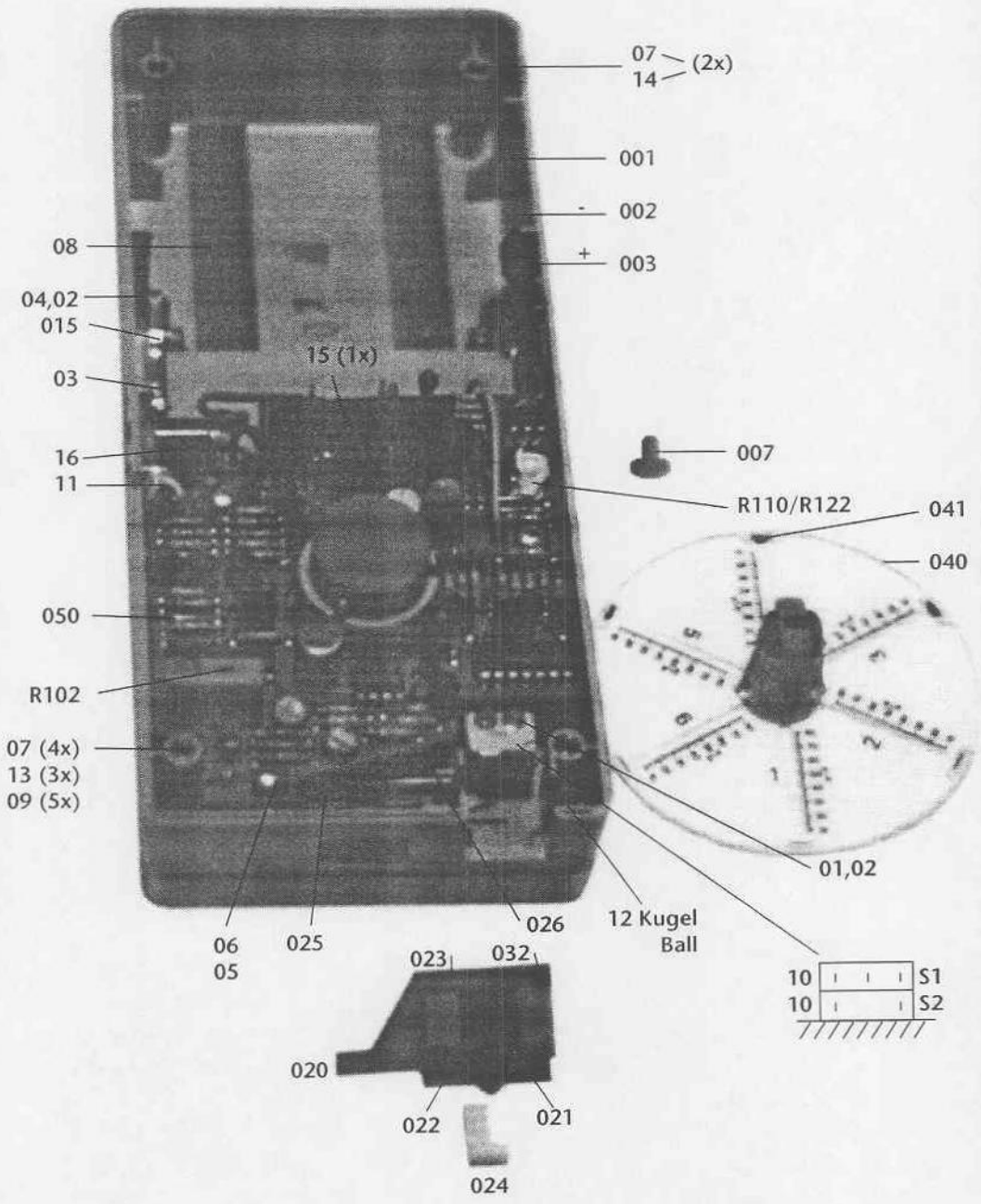
- take off tube clamp.
- remove motor and clean upper housing unit.
- insert new motor in the upper housing unit.
- seal airtight the three slots of the motor attachment with a sealing paste which does not harden. (During centrifugation no air must be taken in through the slots, because otherwise the speed will be reduced).
- fasten motor with tube clamps slightly.
- adjust altitude measure 6,0 - O,1 mm.
- fasten tube clamp tightly.
- assemble centrifuge, insert rotor, the rotor must neither graze the upper housing unit nor the lid.



Sealing paste:

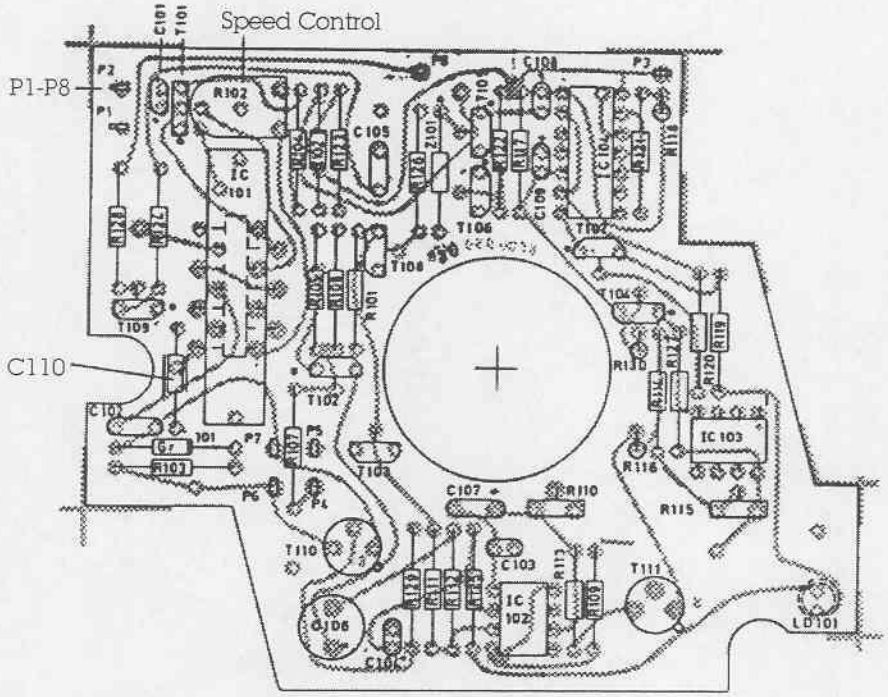
for example Dispersions

SERVICING INSTRUCTIONS for the Minicentrifuge Interior View	6500 000 Table 1



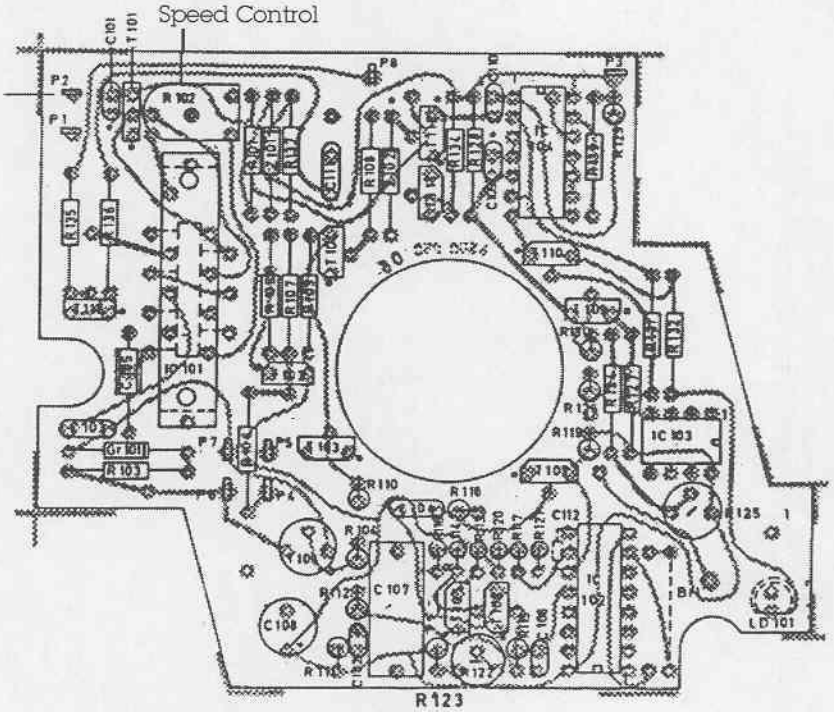
SERVICING INSTRUCTIONS for the Minicentrifuge Printed Circuit Board	6500 000 Table 2

Printed Circuit Board 050 00 . . . 04



R110 Centrifuging time

Printed Circuit Board 6500 050 05/06



R122 Centrifuging Time

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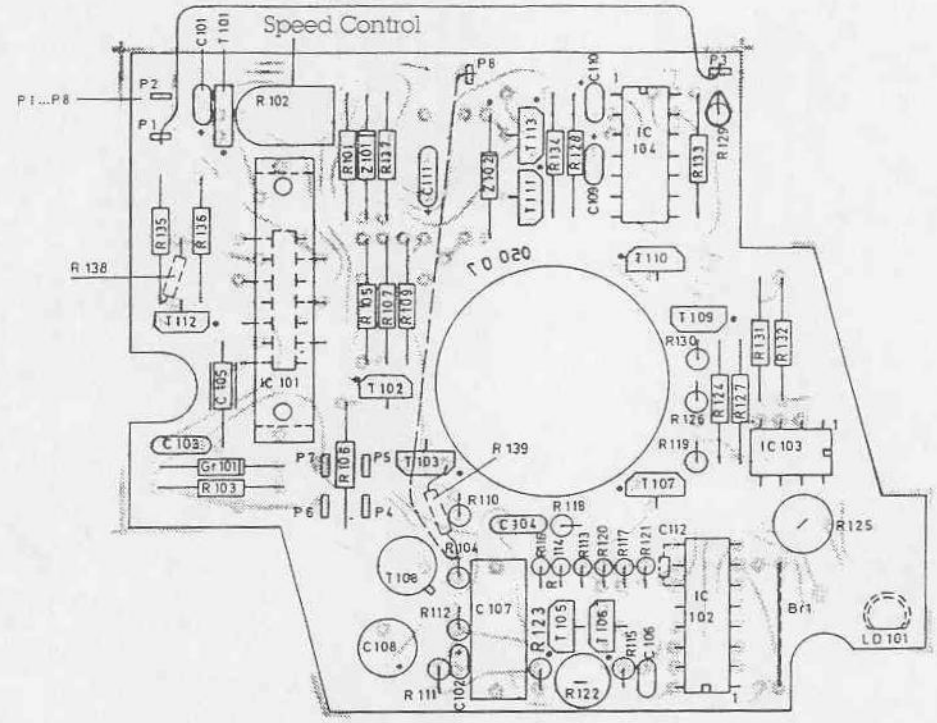
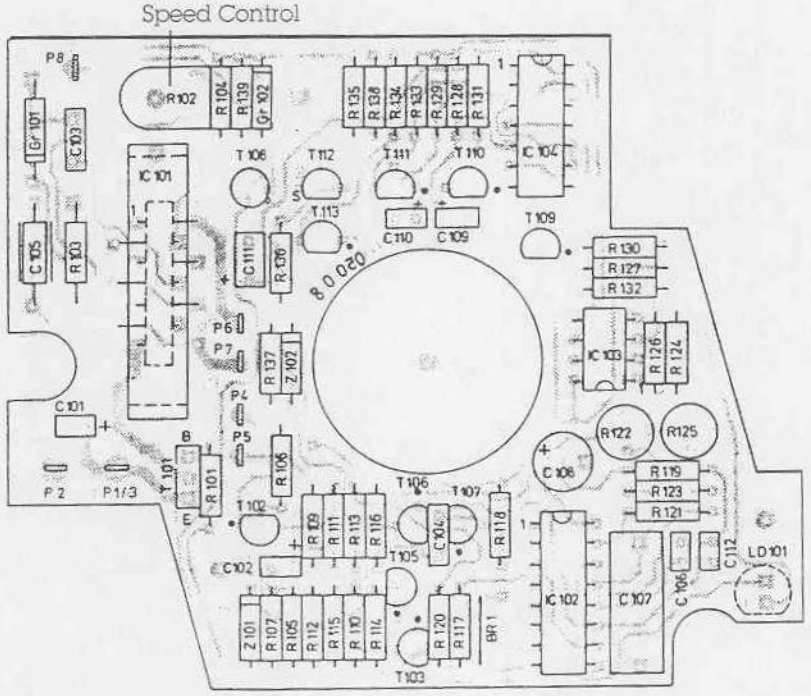
Printed Circuit Board 6500 050 07



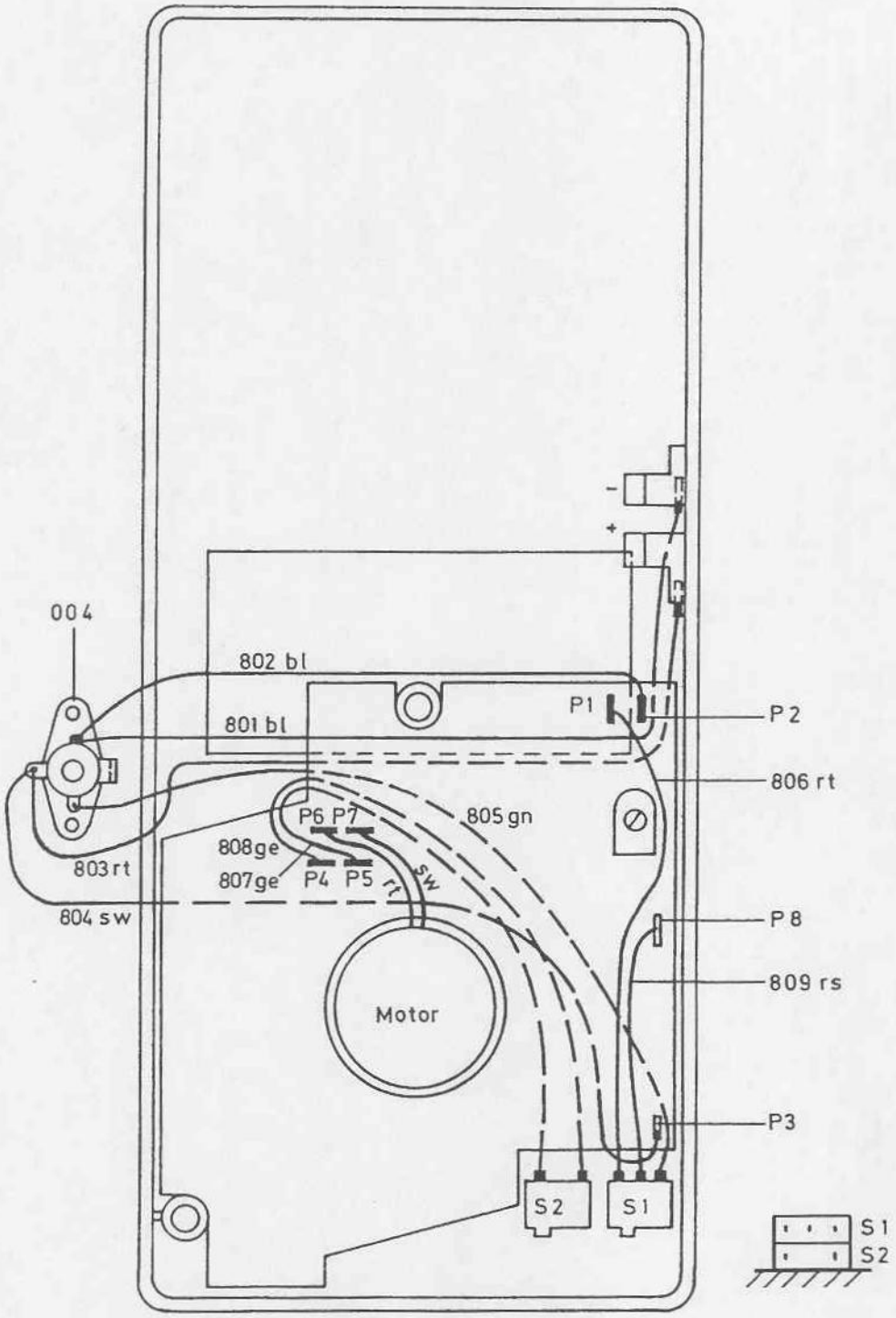
R122: Centrifuging time

Printed Circuit Board 6500 050 08



R122: Centrifuging Time

SERVICING INSTRUCTIONS for the Minicentrifuge Wiring Diagram	6500 000 Table 4



Minicentrifuge with printed circuit board 6500 050 00 . . . 06

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SERVICING INSTRUCTIONS for the Minicentrifuge Wiring Diagram	6500 000 Table 5

with printed circuit board
6500 050 -- 08

with printed circuit board
6500 050 -- 07

bl = blue, rt = red, ge = yellow, gn = green, rs = pink, sw = white

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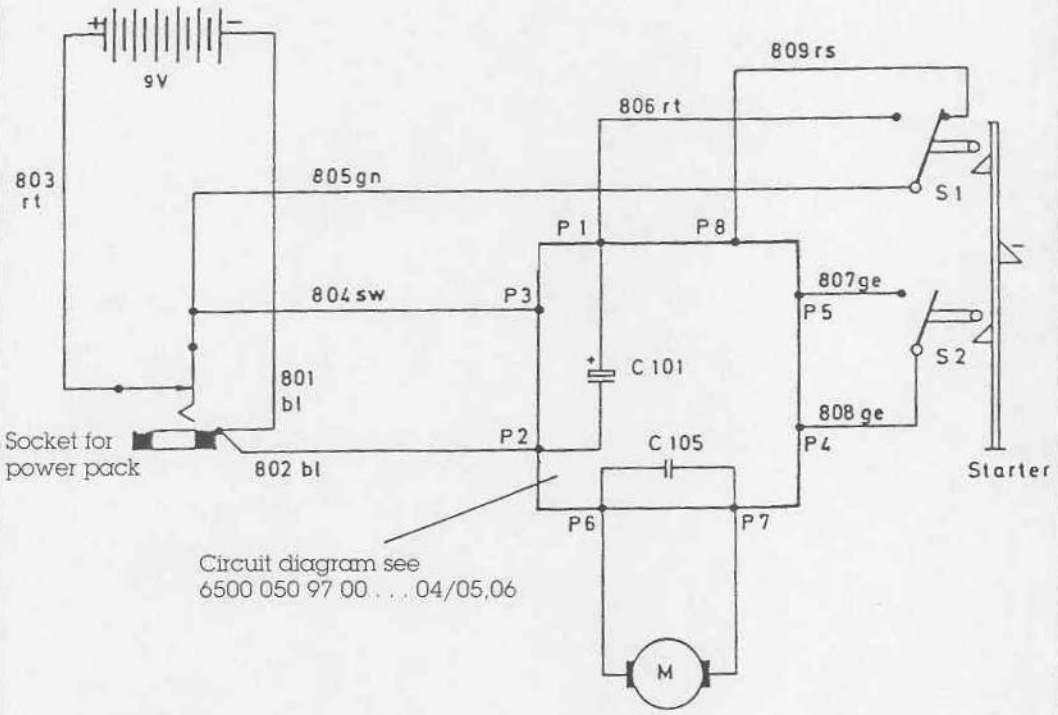
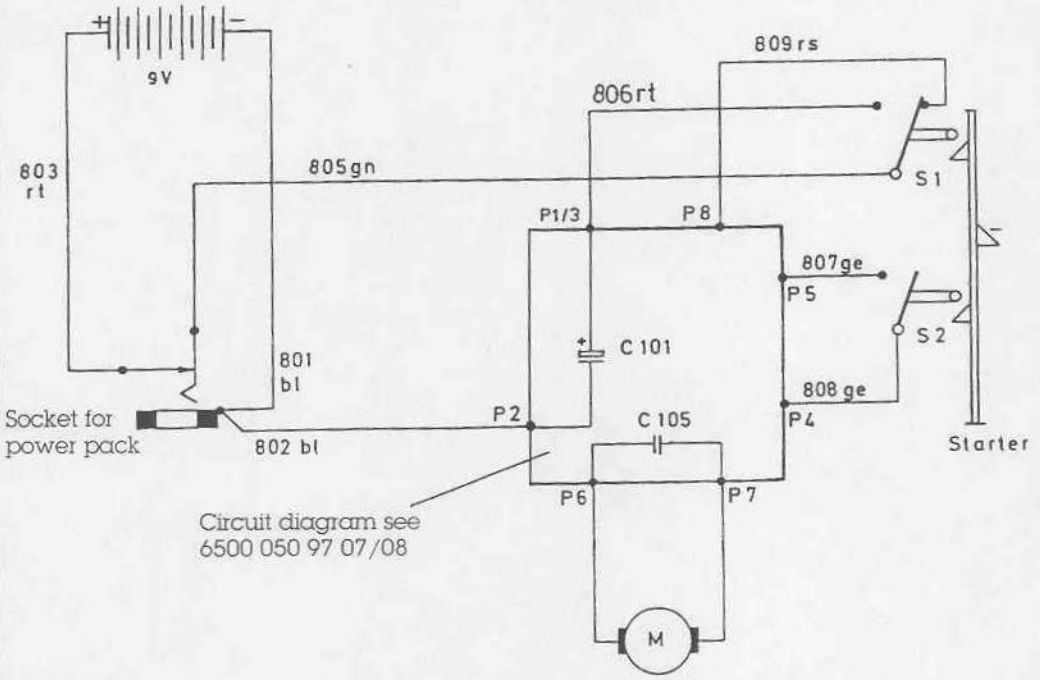
SERVICING INSTRUCTIONS for the Minicentrifuge Block Diagram	6500 000 Table 6

With Printed Circuit Board 6500 000 050 -- Index 00 . . . 06



With Printed Power Pack 6500 050 -- Index 08



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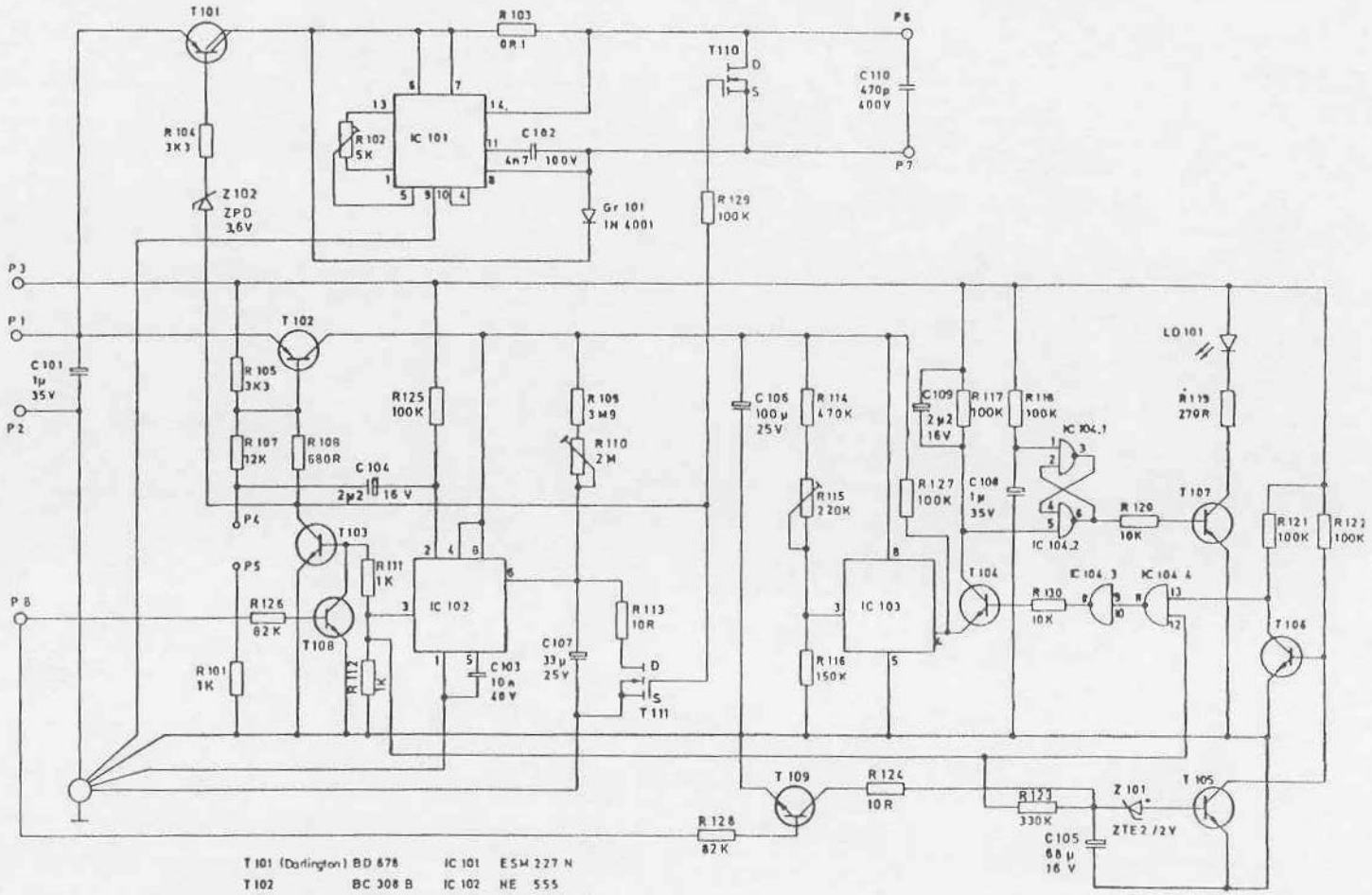

COMPUR-ELECTRONIC GmbH	SERVICING INSTRUCTIONS COMPUR M1100 and M1101	Circuit Diagram for: Printed Wiring Board 6500 050 00 . . . 04	6500 000 97 03 Edition: 08.1979

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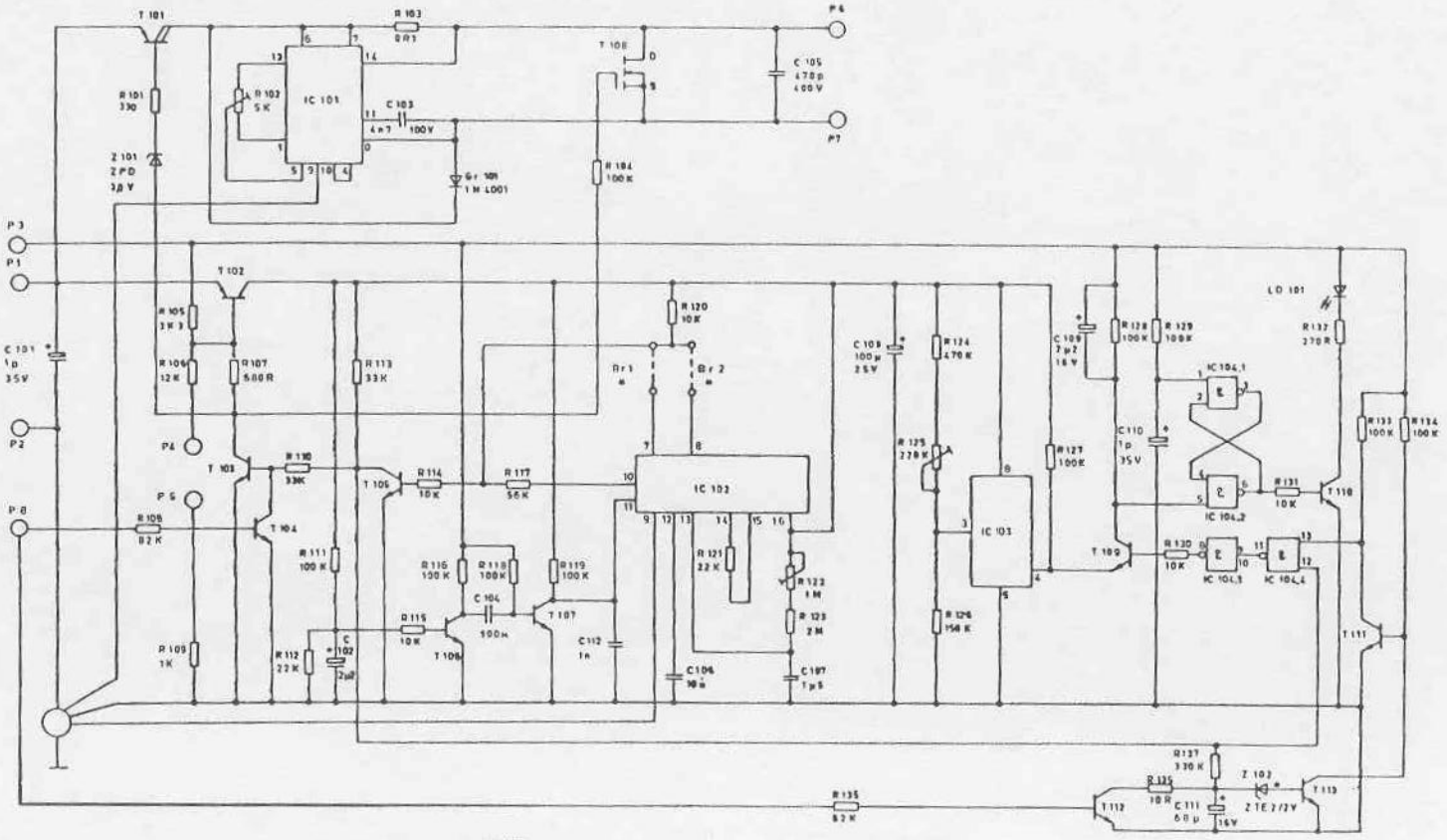
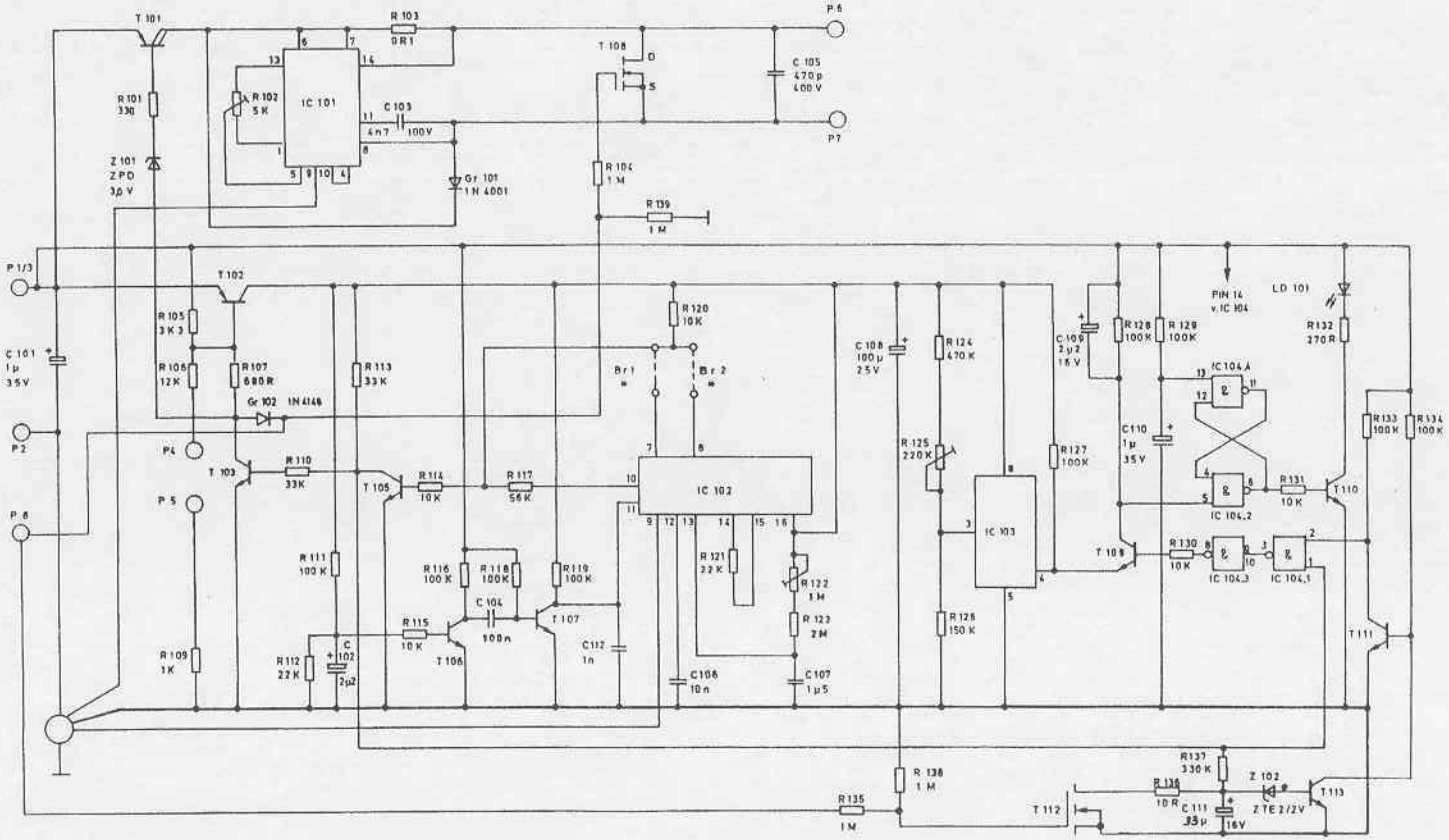


Br 1	Br 2	t
zu	offen	3 min 20 sec
offen	zu	8 min

T 101 (Darlington)	BC 517
T 102	BC 309 B
T 103 - T 107	BC 239 B
T 108	VM P 3
T 109 - T 113	BC 238 B

IC 101	ESM 227 N
IC 102	XR 2240
IC 103	ICL 9211 CPA
IC 104	MM 74C 00 N

COMPUR-ELECTRONIC GmbH	SERVICING INSTRUCTIONS COMPUR M1100 and M1101	Circuit Diagram for: Printed Wiring Board 6500 050 05 u. 06	6500 000 97 06 Edition: 08.1979



*	Br 1	Br 2	t
	zu	offen	3 min 20 sec
	offen	zu	8 min

T 101 (Darlington)	BC 516
T 102	BC 308 B
T 103 - T 107	BC 238 B
T 108	VM P 2
T 109 - T 111 u. T 113	BC 238 B
T 112	VN 10KM

IC 101	ESM 227 N
IC 102	XR 2240
IC 103	ICL 9211 CPA
IC 104	MM 74C 00 N

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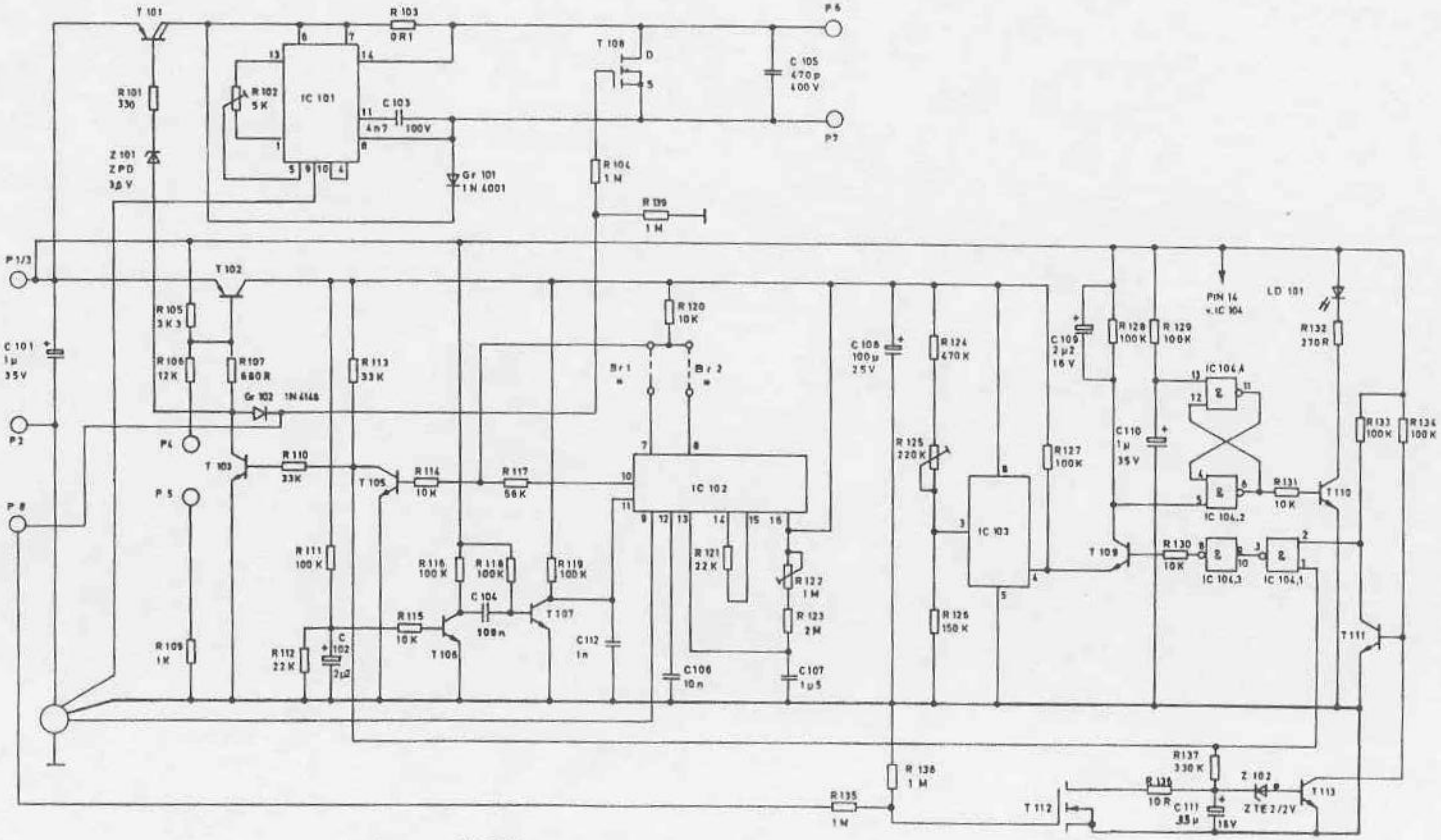
COMPUR-ELECTRONIC GmbH	SERVICING INSTRUCTIONS COMPUR M1100 and M1101	Circuit Diagram for: Printed Wiring Board 6500 050 07	6500 000 050 97 07 Edition: 10.83



*	Br 1	Br 2	t
	zu	offen	3 min 20 sec
	offen	zu	8 min

T 101 (Darlington)	BC 878
T 102	BC 308 B
T 103 - T 107	BC 238 B
T 108	VMP 2
T 109 - T 111 u. T 113	BC 236 B
T 112	VN 10 KM

IC 101	ESM 227 N
IC 102	XR 2240
IC 103	ICL 8211 CPA
IC 104	MM 74C 00 N

COMPUR-ELECTRONIC GmbH	SERVICING INSTRUCTIONS COMPUR M1100 and M1101	Circuit Diagram for: Printed Wiring Board 6500 050 97
		6500 000 050 97 08 Edition: 10.83

SYNOPSIS OF CONTRACT

RE: Compur Hematocrit Centrifuge

Contract # DLA 120
Required Tool for Repair: Phillips Head Screwdriver

INSTRUCTIONS FOR REPAIR

1) Remove one (1) exposed screw on back side.
2) Remove two (2) screws in the battery compartment.
3) Remove two (2) rubber bumpers and unscrew both screws to remove frame in order to get to the:
   a) *control printed circuit*
   b) starter switch
   c) timer

RECOMMENDED REPLACEMENT PARTS

1) Rubber bumper feet, 10 set/1 dz Centrifuges
2) Set of switch, bearings and springs, 1 set/1 dz Centrifuges
3) Seals

WARNING

1) Do not lose ball bearing nor spring when replacing switch.
2) Ball bearing must be located in spotted hole.
3) Otherwise starter switch will be difficult in putting in place.

CLEANING INSTRUCTIONS

Clean Centrifuge Disc (Hematocrit or Plasma rotor) everyday.
Just rinse it in a stream of cold water (see also point 7 of the operating instructions).

1) Enclosed cleaning brush
2) Serves for cleaning of clamping and sealing mechanism (seals)

TOOL & TEST EQUIPMENT LIST

NO SPECIAL TOOLS REQUIRED
PHILLIPS HEAD SCREWDRIVER

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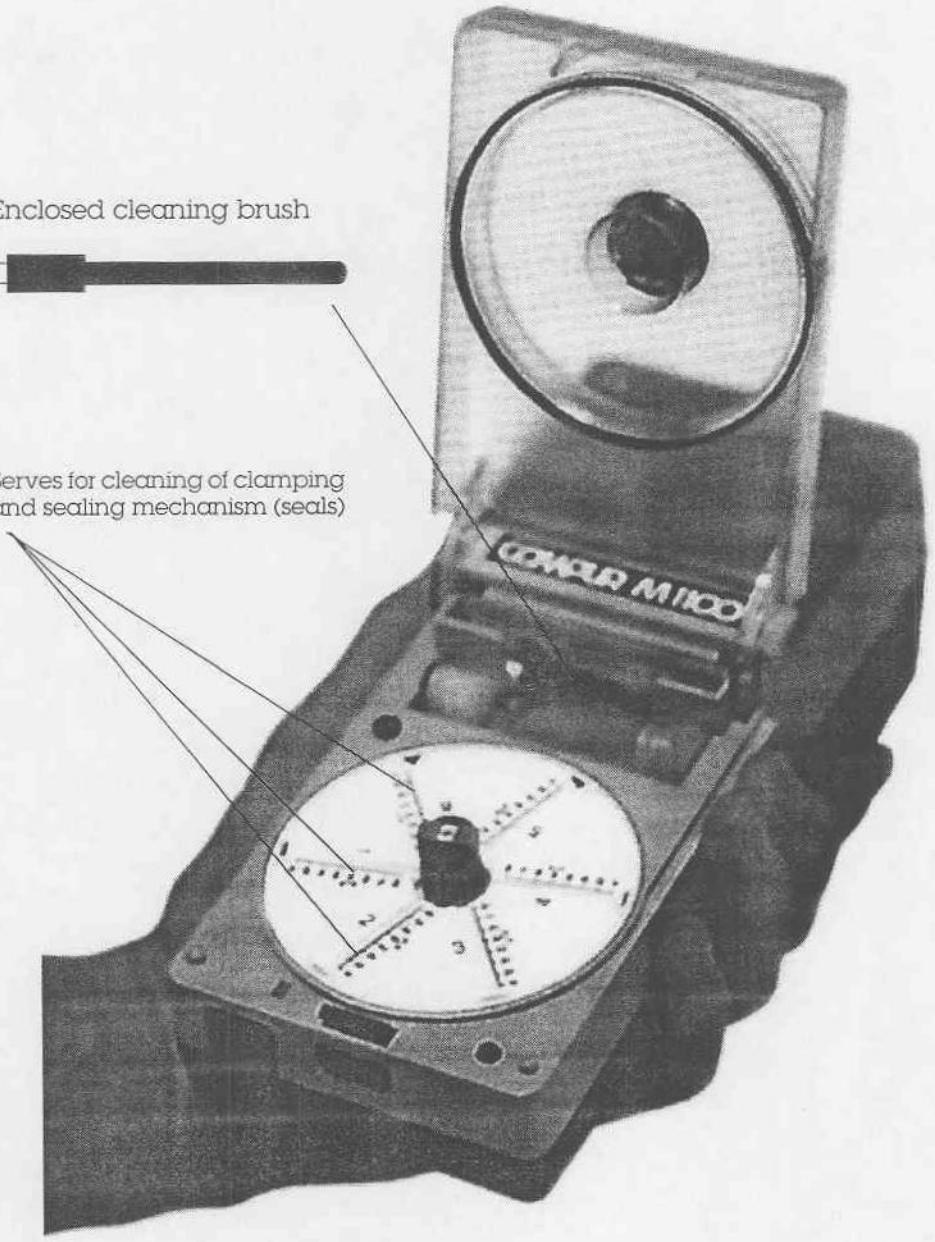
ATTENTION

Cleaning Instructions

Please clean centrifuge disc (Hematocrit or Plasma rotor) every day. Just rinse it in a stream of cold water (see also .7 of the operating instructions).

1. Enclosed cleaning brush

2. Serves for cleaning of clamping and sealing mechanism (seals)



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Centrifuge, Laboratory

Microhematocrit, Battery Power

Contract -DLA120-93-C8508 Contractor: Scientific Supply Co.

(1)	(3)	(4)	(8)	(10)	(11)
0001		002	Upper housing w/motor	1	ea
0002		007	Bumper feet, 4/set	1	set
0003	4	012	On-off Switch	1	ea
0004	5	017	Cover Lock Button	1	ea
0005	6. 7. 9 & 11	020	Clamping Member, Catch Lever Rotor % Scale for HCT Valve	1	set
0006	8	051	Seal 6/pk	1	pk
0007		036	Switches S-1 & S-2	1	set
0008		022	Printed Circuit Board & Timer	1	ea
0009	12	009	Space for Lancets	1	ea
0010	1	023	Battery Pack	1	ea
0011	2	024	Slide Bars for Battery Pack	1	ea
0012	3	042	Socket for Power Pack	1	ea
0013	10	043	Battery Warning Lamp	1	ea

(-1) Our Item 1
(-3) * Shown on drawing
(-4) Mfr. Catalog Number
(-8) Description
(-10) Quantity
(-11) Unit of Measure

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Special Storage Instructions

No special storage instructions are required for indoors or outdoors.

If batteries have been installed in unit, remove them.